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ARITHMETIC.

Conducted by B. F. FINKEL, Springfield, Mo. All contributions to this department should be sent to him.

SOLUTIONS OF PROBLEMS.

81. Proposed by B. F. FINKEL, A. M., M. Sc., Professor of Mathematics and Physics, Drury College, Springfield, Missouri.

How far will a body fall in the first second on the sun, the density of the sun being 25 times that of the earth and its diameter 866400 miles?

Solution by G. B. M. ZERR, A. M., Ph. D., President of Russell College, Lebanon, Va.; and E. W. MORRELL, A. M., Professor of Mathematics, Montpelier Seminary, Montpelier, Vt.

Let G =gravity on sun, g =gravity on earth.

D =density of sun, d =density of earth.

R =radius of sun, r =radius of earth.

Then $G : g = DR : dr$. $\therefore G = gDR/dr$.

Now $g=32.2$, $D=.25d=\frac{1}{4}d$, $R=109.5r$.

$$\therefore G = \frac{32.2 \times 109.5}{4} = 881.475.$$

$\frac{1}{2}G=440.7375$ feet, the distance a body will fall the first second.

82. Proposed by CHAS. C. CROSS, Laytonsville, Md.

Two men, A and B, started from the same point at the same time; A traveled southeast for 10 hours and at the rate of 10 miles per hour, and B due south for the same time, going 6 miles per hour; they then turned and traveled directly towards each other at the same rates respectively, till they met. How far did each man travel?

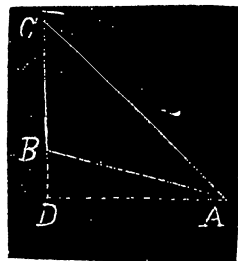
Solution by M. A. GRUBER, A. M., War Department, Washington, D. C.; G. B. M. ZERR, A. M., Ph. D., President of Russell College, Lebanon, Va.; P. S. BERG, Larimore, N. D.; and H. C. WILKES, Skull Run, Va.

Let C be the starting point; CA =the distance A traveled southeast, and CB =the distance B traveled south. Then $CA=100$ miles, and $CB=60$ miles. Now draw AD perpendicular to CB produced to D . As $\angle D$ =a right angle, and $\angle C=45^\circ$, then $CD=AD$.

Then $2\overline{AD}^2=\overline{AC}^2=100^2$; whence $AD=50\sqrt{2}$, and $BD=50\sqrt{2}-60$. $\therefore$ From the right triangle ADB ,

$$AB = \sqrt{(50\sqrt{2})^2 + (50\sqrt{2}-60)^2} = \sqrt{13600-6000\sqrt{2}}$$

$$= 71.517261 + \text{miles.}$$



A and B together travel 16 miles per hour, and the time required, until they meet in traveling AB , is $\frac{1}{8}$ of $AB=4.469828+$ hours. Therefore, A traveled $44.69828+$ miles and B, $26.81897+$ miles of the distance AB .

∴ The total distance traveled by *A* is 144.69828+ miles, and by *B*, 86.81897+ miles.

This problem was also solved by *F. R. HONEY*, *C. A. JONES*, and *E. W. MORRELL*.

Solutions of problem 80 were received from *G. B. M. Zerr*, *P. S. Berg*, *E. W. Morrell*, *F. R. Honey*, and *H. C. Wilkes*.

NOTE. Hon. Josiah H. Drummond says, in reference to problem 78: "How can you make $986 \times 3 + 569 = 3905$? The question is erroneously enunciated or erroneously solved, or both."

If we assume that the problem is correctly stated, then certainly the published solution is not the solution of the problem. The following is an algebraic statement of the problem as proposed:

Let x = number of cows. Then $3x + 569$ = number of horses. Let y = number of sheep. Then $4y - 126$ = number of cows. Hence, $x = 4y - 126$, $3x = 12y - 378$, and $3x + 569 = 12y - 378 + 569 = 12y + 191$, the number of horses expressed in terms of the number of sheep. Hence, y , the number of sheep, $+4y - 126$, the number cows, $+12y + 191$, the number of horses, or $17y + 65$ = total number = 5169. Solving this equation, we do not obtain integral results. If 9 were changed to 5, then y would be integral, and the problem possible. We failed to find this problem in Brooks' Higher Arithmetic. ERROR.

ALGEBRA.

Conducted by *J. M. COLAW*, Monterey, Va. All contributions to this department should be sent to him.

SOLUTIONS OF PROBLEMS.

72. Proposed by *CHAS. C. CROSS*, Laytonsville, Md.

Prove that $\frac{2\sqrt{2+\sqrt{3}}}{4+\sqrt{6}-\sqrt{2}} = \sqrt{6}-\sqrt{2}+\sqrt{3}-2$, when reduced to its lowest terms.

I. Solution by *JOSIAH H. DRUMMOND*, Portland, Maine.

$$\begin{aligned} \frac{2\sqrt{2+\sqrt{3}}}{4+\sqrt{6}-\sqrt{2}} &= \frac{\sqrt{2}\sqrt{4+2\sqrt{3}}}{4+\sqrt{2}(\sqrt{3}-1)}, = \frac{1+\sqrt{3}}{2\sqrt{2}+\sqrt{3}-1}, \\ &= \frac{(1+\sqrt{3})(2\sqrt{2}-\sqrt{3}+1)}{2(2+\sqrt{3})}, = \frac{(2-\sqrt{3})(1+\sqrt{3})(2\sqrt{2}-\sqrt{3}+1)}{2}, \\ &= \frac{(\sqrt{3}-1)(2\sqrt{2}-\sqrt{3}+1)}{2}, = \sqrt{6}-\sqrt{2}+\sqrt{3}-2. \end{aligned}$$

II. Solution by *G. B. M. ZERR*, A. M., Ph. D., Russell College, Lebanon, Va.; and *P. S. BERG*, Principal of Schools, Larimore, N. D.

$$\frac{2\sqrt{2+\sqrt{3}}}{4+\sqrt{6}-\sqrt{2}} = \frac{\sqrt{6}+\sqrt{2}}{4+\sqrt{6}-\sqrt{2}}, = \frac{(\sqrt{6}+\sqrt{2})(4+\sqrt{6}+\sqrt{2})}{(4+\sqrt{6})^2-2},$$